

REMARKS

Claims 1 to 3 and 5 are all the claims pending in the application, prior to the present amendment.

Claims 2 and 3 have been rejected under the first paragraph of 35 U.S.C. § 112 as failing to comply with the written description requirement.

The Examiner states that the properties recited in claims 2 and 3 are disclosed in the specification as being properties of the alloy recited in claim 1 and are not disclosed as being properties of the claimed magnetic recording medium.

In response, applicants have amended claim 3 by changing the word "which" in line 2 of claim 3 to the phrase -- wherein the magnetic alloy --. Claim 2 has been canceled, since its recitations have been incorporated into claim 1.

Further, applicants have amended claim 3 to change the unit of the magnetic anisotropy constant (Ku) from "J/K" to "J/ms." This amendment is made to correct a clerical error. "J/ms" is used for the unit of the magnetic anisotropy constant (Ku) as SI unit system notation. The "J/ms" designation is indicated in United States Patent No. 5,750,230, a copy of which is enclosed.

Claims 1 and 5 have been rejected under 35 U.S.C. § 102(b) as anticipated by JP-A-09-320847.

In addition, claims 2 and 3 have been rejected under 35 U.S.C. § 102(b) as anticipated by or in the alternative under 35 U.S.C. § 103(a) as obvious over JP '847.

The Examiner states that in Table 1 of JP '847, the first listed alloy and the tenth listed alloy have an average number of valence electrons of 8.34 and 8.26, respectively, which are within the scope of the present claims.

With respect to claims 2 and 3, the Examiner states that JP '847 does not specifically disclose that the alloys of JP '847 have the properties recited in claims 2 and 3, but asserts that one of ordinary skill in the art would have expected these alloys to possess all the same properties as recited in the present claims because the compositions are the same.

In response, applicants have amended claim 1 to incorporate the recitations of claim 2 which has been canceled. Thus, claim 1 recites that the magnetic alloy has an order parameter (S) of 0.5 to 1 as calculated from the following formula:

$$S = [\{F(002)^2/F(001)^2\} \times \{L(002)/L(001)\} \times \{A(002)/A(001)\} \times \{I(001)/I(002)\}]^{1/2}$$

wherein F(plane direction), L(plane direction), A(plane direction), and I(plane direction) represent the structure factor, Lorentz factor, absorption factor, and integration intensity as measured through X-ray diffractometry ($\theta/2\theta$) of the magnetic alloy in the corresponding plane direction, respectively.

Applicants submit that the alloys of JP '847 do not have the properties set forth in claim 1 as amended above.

The first listed and the tenth listed magnetic alloys of Table 1 in JP '847 are FeCoPt and FeCoPtMn alloys, respectively, and satisfy the metal composition and the electronic number average of claim 1 of the present application. However, applicants submit that the values of S of the alloys indicated by JP '847 are not 0.5 to 1.

In support of applicants' position that the indicated alloys of JP '847 do not satisfy the S value of the present claims, applicants enclose herewith a Fig. 4-6, a Fig. 4-7, and a Fig. 4-8, which is an enlargement of a portion of Fig. 4-7.

Fig. 4-6 is an experimental result by the inventors of this application. This result shows the relation between the substrate temperature (T_s) and the X ray diffraction spectrum of the $\text{Fe}_{50}\text{Pt}_{50}$ alloy. The horizontal axis of Fig. 4-6 is the degree of angle in the X ray diffraction spectrum and the vertical axis is the signal strength. The upper row of Fig. 4-6 is the result of a substrate temperature of 200°C , the middle row is the result of a substrate temperature of 250°C and the lower row is the result of a substrate temperature of 500°C .

Fig. 4-6 shows that the substrate temperature and the intensity ratio of the FePt (001) signal, which appears near 25° , and the FePt (002) signal, which appears near 49° , have correlation. The notation "fct" indicated in Fig. 4-6 is the abbreviation for face centered tetragonal lattice. An FePt alloy has a fct structure.

JP '847 discloses in its Fig. 3, a copy of which is enclosed, the X ray diffraction spectrum of its $\text{Fe}_{50}\text{Pt}_{50}$ alloy. When the result of Fig. 3 of JP '847 and the result of Fig. 4-6 are compared, it turns out that the alloy of Fig. 3 of JP '847 is believed to be equivalent to an alloy formed at a substrate temperature lower than the 250°C in Fig. 4-6. Applicants refer the Examiner to the ratio of the intensity of the FePt (001) signal and the FePt (002) signal in the $\text{Fe}_{50}\text{Pt}_{50}$ alloy indicated in Fig. 3 of JP '847.

In particular, the ratio of the intensity of the FePt (001) signal and the FePt (002) signal in the alloy of Fig. 3 of JP '847 is about 1.

In the lower row of Fig. 4-6, at a substrate temperature of 500°C, the ratio of intensity is greater than 1. In the middle row, at a substrate temperature of 250°C, the ratio of intensity is slightly greater than 1. In the upper row, at a substrate temperature of 200°C, the ratio of intensity is substantially less than 1.

Since the ratio of intensity in Fig. 3 of JP '847 is about 1, whereas in the middle row of Fig. 4-6 it is slightly greater than 1, then the substrate temperature for Fig. 3 of JP '847 must be less than the 250°C shown in the middle row.

Paragraph [0035] of JP '847 indicates that the $\text{Fe}_{50}\text{Pt}_{50}$ alloy was formed at a substrate temperature of 500°C by a sputtering method. On the other hand, the result by the inventors of this application in Fig. 4-6 uses electron beam deposition method. For this reason, applicants believe that the difference of this production method affected the relation between substrate temperature and alloy structure.

In particular, if the energy of a deposition atom formed by the sputtering method is compared with the energy of a deposition atom formed by the electron beam deposition method, both have a remarkable difference. The energy of a deposition atom formed by an electron beam deposition method is very high compared to the energy of a deposition atom formed by the sputtering method. For this reason, applicants believe that when the electron beam deposition method was used in low T_s , the alloy which is equivalent to high T_s by the sputtering method formed.

Fig. 4-7 is the experimental result by the inventors of this application. The upper row of Fig. 4-7 shows the relation of substrate temperature (T_s) and S in an $(\text{Fe}_x\text{Co}_{100-x})_{50}\text{Pt}_{50}$ alloy. In the upper row of Fig. 4-7, the plot of the "square" marks, \blacksquare ($x=100$), represents the values for

the $\text{Fe}_{50}\text{Pt}_{50}$ alloy. As can be determined from Fig. 4-7, an $\text{Fe}_{50}\text{Pt}_{50}$ alloy whose value of S is 0.5 or more is not obtained at a substrate temperature lower than 250°C.

In particular, Fig. 4-8 is an enlargement of the upper row of Fig. 4-7, and contains three lines that have been drawn in the upper row. The three lines are a vertical line A at a substrate temperature of 250°C, a horizontal line B at an S value of 0.5, and a curved line C that is an approximation line based on the "square" data marks for the $\text{Fe}_{50}\text{Pt}_{50}$ alloy. As can be seen from Fig. 4-8, for an $\text{Fe}_{50}\text{Pt}_{50}$ alloy, a value of S of 0.5 or more is not obtained below a temperature of 250°C.

Moreover, Fig. 4-7 shows the relation of Ts and S in case of adding Co and Ni to the FePt system alloy. As shown in Fig. 4-7, an alloy whose value of S is 0.5 or more is not obtained at a temperature lower than 250°C.

The present inventors have not investigated all the addition elements and all the combinations of those indicated by JP '847. However, the order parameter (S) is influenced very much by the value of I (001)/I (002), and the value of I (1)/I (002) is governed by the structure of the alloy, i.e., the structure of an FePt alloy. For this reason, the inventors believe that if all the addition elements indicated by JP '847 are added to an FePt system alloy, the alloy whose value of S is 0.5 or more would not be obtained at the temperature lower than 250°C in Fig. 4-7.

In addition, with respect to claim 3 of the present application, JP '847 does not disclose or suggest a magnetic alloy having a high value of Ku, and does not disclose or suggest that such a high value can be obtained by raising the substrate temperature, or that a permanent magnet alloy which is excellent in magnetic property can be obtained by raising the substrate temperature. The magnetic recording medium disclosed by JP '847 has the structure of having a

buffer layer and a magnetic film on the buffer layer. Therefore, it is necessary to suppress the counter diffusion between the buffer layer and the magnetic film, and film forming temperature cannot be raised. See paragraph [0032] of JP '847. That is, there is a clear technical reason which leads one of ordinary skill in the art away from raising the substrate temperature at the time of forming the magnetic layer in JP '847.

In view of the above, applicants submit that JP '847 does not disclose or render obvious the subject matter of the present claims and, accordingly, request withdrawal of these rejections.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.


Respectfully submitted,

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